CLAIMS

1. An automation system for controlling and monitoring devices in a network of devices comprising:

a plurality of devices to be controlled, each device comprising:

a radio frequency receiver for receiving signals,

a radio frequency transmitter for transmitting signals,

a memory for storing data representing a device identifier identifying the device and storing other data,

a processing unit for administering the reception and transmission of signals and being adapted to read data from and store data in the memory,

a controller comprising:

a radio frequency transmitter for transmitting signals,

a radio frequency receiver for receiving signals,

a memory for storing data representing a controller identifier identifying the controller and storing data representing a device table holding device identifiers of devices controlled by the controller,

a processing unit for administering the reception and transmission of signals and being adapted to read data from and store data in the memory,

wherein the processing unit of the controller comprises means for generating a first signal for instructing a first device to discover other devices within its range, said first signal comprising the device identifier of the first device as a destination identifier and at least some device identifiers from the device table, and

wherein the processing unit of any first device of the plurality of devices comprises means for:

- upon receiving a first signal with its identifier as destination identifier, generating second signals for each device identifier in the first signal, each second signal comprising a device identifier from the first signal as destination identifier and the device identifier of the first device as source identifier,
- acknowledging the reception of a second signal by generating a third signal comprising the source identifier of the received second signal as destination identifier and the destination identifier of the received second signal as source identifier, and

- upon receiving a third signal with its identifier as destination identifier, storing data representing the source identifier of the third signal in its memory.

2. An automation system according to claim 1, wherein the memory of the controller is further adapted to store data representing a routing table, wherein the processing unit of any first device of the plurality of devices further comprise means for generating a fourth signal comprising the identifier of the controller as destination identifier, stored data representing the source identifiers of any received third signals, and the device identifier of the first device as a source identifier, and wherein the processing unit of the controller further comprises means for receiving fourth signals from the devices to be controlled and forming the routing table indicating for each of the plurality of devices, other devices which each device can successfully transmit signals to and receive signals from.

3. An automation system according to claim 1, wherein the memory of the controller is further adapted to store data representing a most used entry point list and wherein the processing unit of the controller further comprises means for forming and storing a most used entry point list in the memory by registering the number of successfully and failed transmitted signals from the controller to each device in the network, said most used entry point list indicating the device identifiers of the devices with which the controller regularly communicates.

4. An automation system according to claim 3, wherein the most used entry point list comprises device identifiers for one or more devices in the network and a counter related to each device identifier in the list, said counter giving an indication of the number of successful transmissions to the related device.

5. An automation system according to claim 4, wherein the means for forming the most used entry point list is adapted to, in case of a transmission to a device in the most used entry point list, increase the counter related to the device if the transmission is successful and to decrease the counter related to the device if the transmission fails, and wherein the means for forming the most used entry point list is further adapted to, in case of a transmission to a device which is not in the most used entry point list, include the device in the most used entry point list if the transmission is successful.

6. An automation system according to claim 2, wherein the memory of the controller is further adapted to store data representing a preferred repeater list and wherein the

processing unit of the controller further comprises a routine for analyzing the routing table to form a preferred repeater list indicating one or more devices which together can route a signal from any device in the routing table to any other device in the routing table and store said preferred repeater list in the memory of the controller.

7. An automation system according to claim 1, wherein the means for generating the first signal is adapted to generate the first signal to the first device in response to a predetermined action.

8. An automation system according to claim 7, wherein the processing unit of the controller is further adapted to add devices to the device table, and wherein the addition of the first device to the device table is a predetermined action.

9. An automation system according to claim 1, wherein each device controlled by the controller is comprised in one or more groups of devices to be collectively controlled, each group comprising at least one device, wherein the processing unit of the controller further comprises means for adding devices to and removing devices from a group, and wherein the means for adding and removing devices to/from groups is adapted to virtually mark a device in the memory of the first processing unit when it is removed from a group.

10. An automation system according to claim 7 and 9, wherein the addition of the first device to a group is a predetermined action if the first device is virtually marked.

11. An automation system according to claim 1, wherein the first signal comprises all device identifiers from the device table, except the device identifier of the first device.

12. An automation system according to claim 1, wherein each of the plurality of devices further comprise means for providing an output to, or receiving an input from, an appliance operationally connected to the device, wherein the processing unit of the controller further comprises means for generating a fifth signal comprising at least one destination identifier corresponding to a device identifiers of a destination device, information related to the operation of the destination device or the appliance connected to the destination device, and repeater identifiers corresponding to one or more signal repeating devices, and wherein one or more of the plurality of devices are further adapted to act as signal repeating devices in that the processing units of each of said one or more devices comprise means for, upon reception of a fifth signal, processing said information in its processing unit if the at least one

destination identifier corresponds to the device identifier of the device, and means for, upon reception of a fifth signal, transmitting a sixth signal holding the at least one destination identifier and said information if one of the one or more repeater identifiers corresponds to the device identifier of the device.

13. An automation system according to claim 12, wherein all devices are adapted to act as signal repeating devices.

14. An automation system according to claim 2 and 12, wherein the processing unit of the controller comprises means for identifying in the routing table device identifiers of devices for repeating a first signal having a predetermined destination identifier, and to include said device identifiers as repeater identifiers in the first signal.

15. A method for determining a network topology in an automation system network for controlling and monitoring devices comprising:

- a plurality of devices to be controlled, each device comprising a memory for storing data representing a device identifier identifying the device and storing data representing a routing line indicating other devices which the device can successfully transmit signals to and receive signals from, and a processing unit for administering the reception and transmission of signals and being adapted to read data from and store data in the memory,
- a controller comprising a memory storing data representing a controller identifier identifying the controller and storing data representing a device table for holding device identifiers of devices controlled by the controller, and a processing unit for administering the reception and transmission of signals and being adapted to read data from and store data in the memory,

said method comprising the steps of:

transmitting a first signal from the controller for instructing a first device to discover other devices within its range, said signal comprising device identifiers from the device table,

receiving the first signal at the first device and transmitting second signals from the first device addressed to devices in the device table,

transmitting a third signal acknowledging the reception of the second signal from each device that received a second signal addressed to it, and

receiving any third signals at the first device and storing data representing the device identifiers of the devices which transmitted the received third signals in the routing line in the memory of the first device.

16. A method according to claim 15, wherein the memory of the controller is further adapted to store data representing a routing table indicating for each of the plurality of devices, other devices which each device can successfully transmit signals to and receive signals from, the method further comprising the steps of:

transmitting a fourth signal from the first device to the controller, the fourth signal holding the routing line, and

receiving the fourth signal at the controller and storing the routing line in the routing table of the memory of the controller.

17. A method according to claim 15, wherein the memory of the controller is further adapted to store data representing a most used entry point list indicating the device identifiers of the devices with which the controller regularly communicates and a counter related to each device identifier in the list, said counter giving an indication of the number of successful transmissions to the related device, the method further comprises the steps of registering the number of successfully and failed transmitted signals from the controller to each device in the network, and after a transmission to a device in the most used entry point list, increasing the counter related to the device if the transmission is successful and decreasing the counter related to the device if the transmission fails.

18. A method according to claim 17, further comprising the steps of, in case of a transmission to a device which is not in the most used entry point list, including the device in the most used entry point list if the transmission is successful.

19. A method according to claim 16, wherein the memory of the controller is further adapted to store data representing a preferred repeater list, the method further comprising the steps of analyzing the routing table to identify one or more devices which together can route a signal from any device in the routing table to any other device in the routing table, and

storing data representing the device identifiers of these one or more devices in the preferred repeater list.

20. A method according to claim 15, wherein the controller is triggered to transmit the first signal for instructing the first device to discover other devices within its range by a predetermined action.

21. A method according to claim 20, wherein the processing unit of the controller is further adapted to add devices to the device table, and wherein the addition of the first device to the device table is a predetermined action.

22. A method according to claim 20, wherein each device controlled by the controller is comprised in one or more groups of devices, each group comprising at least one device, and wherein the processing unit of the controller further comprises means for adding devices to and removing devices from a group, wherein a device is virtually marked when it is removed from a group, and wherein the addition of a device to a group is a predetermined action if the added device is virtually marked.

23. A controller for controlling devices in an automation system, said controller comprising:

a radio frequency transmitter for transmitting signals,

a radio frequency receiver for receiving signals,

a memory for storing data representing a controller identifier identifying the controller and storing data representing a device table holding device identifiers of devices controlled by the controller,

a processing unit for administering the reception and transmission of signals and being adapted to read data from and store data in the memory,

wherein the processing unit of the controller comprises means for generating a first signal for instructing a first device to discover other devices within its range, said first signal comprising the device identifier of the first device as a destination identifier, a list of device identifiers from the device table, and instructions to the first device to generate and transmit signals to the devices from said list for determining which devices from said list can be reached from the first device.

24. A device to be controlled by a controller in an automation system comprising a plurality of devices, said device comprising:

a radio frequency receiver for receiving signals,

a radio frequency transmitter for transmitting signals,

a memory for storing data representing a device identifier identifying the device and storing other data,

a processing unit for administering the reception and transmission of signals and being adapted to read data from and store data in the memory,

wherein the processing unit of the device comprises means for:

- upon receiving a first signal comprising its identifier as destination identifier, a list of device identifiers, and instructions to the device to generate and transmit signals to devices from said list for determining which devices from said list can be reached from the device, generating second signals for each device identifier in the list, each second signal comprising a device identifier from the list as destination identifier and the device identifier of the device as source identifier,
- acknowledging the reception of a second signal by generating a third signal comprising the source identifier of the received second signal as destination identifier and the destination identifier of the received second signal as source identifier, and
- upon receiving a third signal with its identifier as destination identifier, storing data representing the source identifier of the third signal in its memory.

25. A method for routing signals in an automation system network for controlling and monitoring devices comprising:

- a plurality of devices to be controlled, each device comprising a memory storing data representing a device identifier identifying the device and a processing unit for administering the reception and transmission of signals,
- a controller comprising a memory storing data representing a controller identifier identifying the controller, storing data representing a routing table indicating for each of the plurality of devices, other devices which each device can successfully transmit signals to and receive signals from, and storing data representing a most used entry point list being an ordered list indicating the device identifiers of the number, N, of devices that have the highest transmission success counter corresponding to the number of successful transmission from the controller to a device minus the number of failed transmissions from the controller to the device, and a processing unit for administering the reception and transmission of signals and being adapted to read data from and store data in the memory,

said method comprising the steps of:

A. transmitting a first signal from the controller to a specified device at least once, said signal comprising the identifier of the specified device as a destination identifier,

B. if said first signal is received by the specified device, transmitting an acknowledgement signal from the specified device to the controller

C. if no acknowledgement signal is received by the controller, then choosing the first device from the most used entry point list as a first repeating device

D. determining a route to the specified device in the routing table, the route using one or more repeating devices, the first of which is the first repeating device,

E. transmitting a second routed signal from the controller at least once, said signal comprising the identifier of the specified device as a destination identifier and the identifiers of the one or more repeating devices from the route determined in step D as repeater identifiers,

F. transmitting a routed acknowledgement signal from the specified device to the controller upon reception of the routed second signal, and

G. as long as no routed acknowledgement signal is received by the controller from the specified device, then repeating steps D, E, and F for N-1 times using the second, third,...Nth device from the most used entry point list as a first repeating device.

26. A method according to claim 25, wherein the memory of the controller further stores data representing a preferred repeater list indicating one or more devices which together can route a signal from any device in the routing table to any other device in the routing table, and wherein the method further comprises the steps of:

H. if no routed acknowledgement signal of the Nth second routed signal is received by the controller from the specified device, then choosing the first device from the preferred repeater list that is not in the most used entry point list as a first repeating device,

I. determining a route to the specified device in the routing table, the route using one or more repeating devices, the first of which is the first repeating device,

J. transmitting a second routed signal from the controller, said signal comprising the identifier of the specified device as a destination identifier and the identifiers of the one or more repeating devices from the route determined in step H as repeater identifiers,

K. transmitting a routed acknowledgement signal from the specified device to the controller upon reception of the routed second signal, and

L. as long as no routed acknowledgement signal is received by the controller from the specified device, then repeating steps H, I, and J for each device in the preferred repeater list using the corresponding device from the preferred repeater list as a first repeating device.

27. A method according to claim 25, wherein the processing units of each of the plurality of devices are further adapted to provide an output to, or receive an input from, an appliance operationally connected to the device, the method further comprising the steps of:

transmitting a third signal from the controller, the third signal comprising at least one destination identifier corresponding to the identifier of a destination device or destination controllers, information related to the operation of a device or an appliance connected to a device, and one or more repeater identifiers corresponding to device identifiers one or more signal repeating devices,

receiving the third signal at one of said plurality of devices,

if the at least one destination identifier corresponds to the device identifier of the receiving device, then processing said information in the processing unit of the device, and

if one of the one or more repeater identifiers correspond to the device identifier of the receiving device, then transmitting a fourth signal holding said at least one destination identifier and said information.

28. A method according to claim 27, wherein the third signal is transmitted by the controller, the at least one destination identifier comprised in the third signal is a device identifier, and wherein the information comprised in the third signal comprises instructions to a processing unit of the destination device to provide an output to, or receive an input from, the appliance connected to the destination device.

29. A method according to claim 27, wherein the third signal is transmitted by a device, wherein the at least one destination identifier comprised in the third signal is a controller identifier, and wherein the information held by the third signal is related to a state or a reading of the device transmitting the third signal.

30. A method according to claims 27, further comprising the step of, upon receiving a third or a fourth signal at a device or a controller, generate and transmit a first acknowledgement signal having the identifier of the device or controller transmitting the third or fourth signal as destination identifier.

31. A method according to claim 30, wherein the first acknowledgement signal comprises a destination identifier and one or more repeater identifiers, the method further comprising the steps of receiving said first acknowledgement signal at a device and if one of the one or more repeater identifiers correspond to the device identifier of the receiving device, then transmitting a second acknowledgement signal holding said destination identifier.